

## **WHAT IS CLAIMED IS:**

- 1           1.       A data acquisition system, comprising an accumulator having two  
2       or more parallel accumulation paths and configured to accumulate corresponding  
3       data samples across a transient sequence through different accumulation paths.
- 1           2.       The data acquisition system of claim 1, further comprising a sampler  
2       coupled to the accumulator and configured to produce a plurality data samples  
3       from a transient sequence.
- 1           3.       The data acquisition system of claim 2, wherein the sampler  
2       comprises an analog-to-digital converter.
- 1           4.       The data acquisition system of claim 1, further comprising a  
2       controller coupled to the accumulator and configured to cycle the accumulation of  
3       data samples through each of the accumulation paths.
- 1           5.       The data acquisition system of claim 4, wherein the controller is  
2       configured to selectively enable each accumulation path.
- 1           6.       The data acquisition system of claim 1, wherein each accumulation  
2       path comprises an adder and a memory.
- 1           7.       The data acquisition system of claim 6, wherein the accumulation  
2       path memory comprises a dual port random access memory.
- 1           8.       The data acquisition system of claim 1, wherein each accumulation  
2       path is configured to produce an output representative of the sum of two inputs.
- 1           9.       The data acquisition system of claim 8, wherein the accumulation  
2       paths are coupled in series, with a first input of each accumulation path coupled  
3       to a sampler and a second input of each accumulation path coupled to the output  
4       of another accumulation path.
- 1           10.      The data acquisition system of claim 1, further comprising an ion  
2       detector.
- 1           11.      A time-of-flight mass spectrometer, comprising:

an ion detector configured to produce a transient sequence from a plurality of ion packets;

a sampler configured to produce a plurality of data samples from the transient sequence; and

an accumulator coupled to the sampler, comprising two or more accumulation paths and configured to accumulate corresponding data samples across the transient sequence through different accumulation paths.

12. The mass spectrometer of claim 11, further comprising a controller coupled to the accumulator and configured to cycle the accumulation of data samples through each of the accumulation paths.

13. The mass spectrometer of claim 11, wherein the sampler comprises an analog-to-digital converter.

14. A method of acquiring data, comprising:  
producing a plurality of data samples from a transient sequence; and  
accumulating corresponding data samples across the transient sequence through two or more parallel accumulation paths.

15. The method of claim 14, further comprising cycling the accumulation of data samples through each of the parallel accumulation paths.

16. The method of claim 15, wherein data samples are cycled by selectively enabling each accumulation path.

17. The method of claim 15, wherein data samples are cycled by selectively directing consecutive data sample sets to a respective accumulation path.

18. The method of claim 14, further comprising converting an analog transient into one or more digital data samples.

19. The method of claim 14, further comprising producing a transient from a received ion packet.

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